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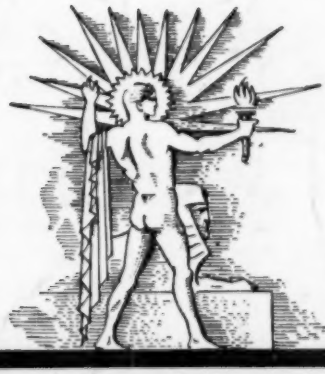
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



July 12, 1941

"Jug-o'-Rum!"

See Page 24

A SCIENCE SERVICE PUBLICATION

Do You Know?

Otters enjoy sliding down steep banks into the water.

Ninety-nine per cent. of the world's people use *cotton*.

An optical company says that it takes half as long to build a *range finder* as a battleship.

The world's purest native *gold* is so-called sponge gold from mines of Kalgoorlie, Australia.

In making a *muskrat* coat several thousand pelts may be examined before about 75 are chosen for matched color and quality.

The oldest record of physicians blaming bodily ailments on *bad teeth* is in an Assyrian manuscript of the seventh century B. C.

Finger-prints of two orang-utans and a chimpanzee were recently taken at the Philadelphia Zoo, and showed the same whorls and arches as human prints.

A process for making an improved "richly flavored" *prune* syrup to be diluted for use in drinks and foods has been developed at the University of California.

The *moon's* temperature, an astronomer has reported, can fall violently from 101 degrees Centigrade to minus 117 degrees during an eclipse because the moon has no heat stored in soil or atmosphere to draw on.

QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

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PSYCHOLOGY

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PUBLIC HEALTH

How far north in the United States has endemic typhus fever been reported? p. 24.

The *wild turkey*, which supplied meat for America's pioneers, was a small turkey.

Tung oil is now obtained commercially by mechanical pressing of the kernel; but greater yields may result from extracting the oil, now tested experimentally.

If cards in a cooking recipe file are coated with white *shellac*, stains can be easily wiped off with a damp cloth.

Vitamins are reported to have become a $100,000,000 business.

Cotton insulation for houses is effective in Alaska and in the tropics, government scientists report.

New York Aquarium staff workers recently put a four-foot-long *torpedo ray* into a salt water tank, but not until five men got momentarily paralyzing electric shocks.

Malaria and relapsing *fever*, considered tropical diseases in China, have been carried by refugees and soldiers as far north as Shansi province, about 40 degrees latitude.

SCIENCE NEWS LETTER

Vol. 40 JULY 12, 1941 *No. 2*

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 2101 Constitution Avenue, Washington, D. C. Edited by WATSON DAVIS.

Subscriptions—$5.00 a year; two years, $7.00; 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Back numbers more than six months old, 25 cents.

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Cable address: Scienserve, Washington.

Entered as second class matter at the postoffice at Washington, D. C., under the Act of March 3, 1879. Established in mimeographed form March 18, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Readers' Guide to Periodical Literature, Abridged Guide, and in the Engineering Index.

Members of the American Association for the Advancement of Science have privilege of subscribing to SCIENCE NEWS LETTER, at $3 a year.

The New York Museum of Science and Industry has elected SCIENCE NEWS LETTER as its official publication to be received by its members.

Advertising rates on application. Member Audit Bureau of Circulation.

SCIENCE SERVICE is the Institution for the Popularization of Science organized 1921 as a non-profit corporation.

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GENERAL SCIENCE

New Government Office For Defense Scientific Work

Office of Scientific Research and Development Will Coordinate Work of Defense Agencies and Departments

COORDINATION of all scientific activities concerned with national defense is the objective of the new Office of Scientific Research and Development which has been created within the Office of Emergency Management by Executive order of President Roosevelt. Under the directorship of Dr. Vannevar Bush, president of the Carnegie Institution of Washington and until now chairman of the National Defense Research Committee, the new organization will serve as liaison agency for a number of scientific groups which have hitherto worked independently of each other, reporting directly to the President.

Funds for the promotion of scientific research programs for the production of new weapons and defense materials and methods, and for medical research programs having defense value, are provided by Congressional appropriation. The new Office of Scientific Research and Development is authorized to "initiate and support" such programs. This is a long step forward, for similar bodies set up during previous national emergencies have had only advisory capacity, and could not undertake research programs or other activities on their own initiative. Dr. Bush indicated his intention to "lean heavily" upon these older advisory bodies, particularly the National Academy of Sciences and the National Research Council.

In carrying on the activities authorized by the new executive order, one of the principal disbursing and action agencies will be the already existing National Defense Research Committee, of which President James B. Conant, of Harvard University, has been appointed chairman, succeeding Dr. Bush. It is understood that Dr. Conant's duties will be such that he can carry them out without neglecting his work as a university president.

Other agencies already functioning that will report to the President through Dr. Bush include the National Advisory Committee for Aeronautics and the Health and Medical Committee established by order of the Council of National Defense. Distinctly defense activities of established bureaus in government departments, such as the Bureau of Mines and the National Bureau of Standards, will also come within the purview of the new Office of Scientific Research and Development.

Somewhat similar action was taken in Britain some time ago, when a single coordinating body was appointed to act as liaison agency between the government and about half-a-hundred research groups in various British defense organizations both military and civil.

Close cooperation is provided for, between British and American research bodies. Britain already has an office in this country, and when Dr. Conant was in England recently he set up a similar office there, which is now taken over by the new Office of Scientific Research and Development. British scientists have requested their American colleagues to take over certain basic scientific research, especially in the field of medicine, in order that they may devote their attention more intensively to immediately pressing practical problems.

The new Office of Scientific Research and Development will also mesh closely with the Office of Production Management under William S. Knudsen and the Office of Civilian Defense under Fiorello LaGuardia. The function of Dr. Bush's organization for them, as for the Army and Navy, will be to find useful scientific methods, devices and materials, which these agencies of application can take over, produce and put into use.

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PHYSIOLOGY

Hormone Production By Thyroid Gland Clocked

HOLDING a clock on the thyroid gland to time its production rate as a chemical factory, scientists at the University of California find it takes this U-shaped gland in the neck just two hours to manufacture its highly complex hormone.

This is the first time the formation of a hormone of any of the body's endocrine glands has been measured. The measurements were made by Dr. I. L. Chaikoff, Dr. I. Perlman and M. E. Morton, using tagged atoms of radioactive iodine from the atom-smashing cyclotron. (*Turn to next page.*)

TRANSPARENT

The first rowboat ever made entirely of du Pont's clear methyl methacrylate plastic "Lucite," being launched for a trial in Long Island Sound. Actually it was not designed for deep sea service but for store display.

The course of radioactive iodine fed to laboratory animals was traced from the stomach to the thyroid by an instrument sensitive to the radio waves given off by the charged atoms. It took but a few minutes for the tagged iodine to reach the thyroid gland, and within two hours after the iodine had been given it was synthesized into the thyroid hormone and on its way to various parts of the body.

There are two products of the thyroid: diiodotyrosine, the role of which is uncertain, and thyroxin, believed to be the true hormone. Under-production of thyroxin in youth will stunt physical and mental development. Over-production of thyroxin in children results in giantism. This hormone is important in the adult, also. An over-active thyroid increases the rate of metabolism so that the body burns up energy substances faster than they can be replaced by food, making the subject thin and nervous, as in some goiter patients. A lazy thyroid results in physical and mental debility, and often abets extreme over-weight. So a better understanding of the course of the thyroid hormone in the body, made possible by the tool of radioactive iodine, may lead to important health-keeping discoveries.

Science News Letter, July 12, 1941

MEDICINE

Infantile Paralysis Virus May Enter Body Through Mouth

"Working Hypothesis" That Virus Reaches Brain and Spinal Cord From Alimentary Tract May Speed Conquest

THE virus of infantile paralysis enters the body through the mouth, not through the nose as has long been believed, Dr. Albert Sabin, of the University of Cincinnati, declared at the meeting of the American Medical Association in Cleveland.

If this "working hypothesis," as Dr. Sabin cautiously terms it until further studies prove or disprove it, is correct, conquest of this dreaded malady may be greatly speeded. While Dr. Sabin said nothing about practical results of his findings, anyone who knows the history of disease-fighting knows that far greater strides have been made in conquering diseases such as typhoid fever, whose germs enter the body through the mouth, than diseases such as the common cold, which enter through the nose. Infantile paralysis fighters, unfortunately, have seen so many promises of early conquest of the disease, such as the nasal spray blockade and vaccinations, fail that they are naturally hesitant about expecting too much now.

Dr. Sabin's picture of what happens in infantile paralysis is, briefly, as follows: The virus enters the body by way of the mouth and establishes itself in the alimentary tract, where it multiplies, probably in the walls of the small intestine and the pharynx. It invades the nervous system by two pathways, one leading to the brain by way of the cranial nerves which supply the upper part of the tract or by way of the parasympathetic nerves from the lower alimentary tract, and the other pathway leading into the spinal cord by way of nerve fibers from the intestines. If the greater attack is along the first pathway, the illness will be of the bulbar type which affects the pharynx. If the attack is along the second pathway, the primary paralysis would be in the extremities.

In the non-paralytic and sometimes unsuspected cases, the virus is either limited in some way to the alimentary tract or an equilibrium is reached between the body and the virus before enough nerve cells have been destroyed to interfere with function and cause paralysis.

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PSYCHOLOGY

Different Time Intervals Distinguished by Rats

TRY this one!

See if you can estimate a ten-second interval, or twenty seconds, or thirty. Get a friend to give you start and stop signals, having him time the interval exactly by his watch, and see whether you can tell a ten-second period from a longer one.

It is not an easy job to estimate elapsed time exactly to the second. But you can probably learn easily to tell the difference between a very short and a longer interval.

Not all persons can. War veterans who were shot through the front part of the brain or in some other way suffered an injury to that important brain area are utterly at a loss when they try to tell a longer from a shorter time. They can read the position of clock hands. But they have no real conception of time as an abstract idea.

Yet it has now been discovered that this difficult ability is not confined to man and the other primate animals. Even rats can be trained to tell accurately the difference between a ten-second interval and the longer one of thirty seconds.

How this was done is related by Dr. John T. Cowles, of the University of Illinois, and Dr. John L. Finan, of Oberlin College in a report to the *Journal of Psychology*.

The white rats were put into a Y-shaped box, entering at the tail of the Y. There they were detained by a drop door lowered just short of where the two alleys branched off. Both alleys were also blocked by doors, just alike in appearance. At the end of the delay period, ten seconds on some trials and thirty seconds on others, the drop door was raised and the rat was free to run to one or the other of the gray doors.

If the delay was only ten seconds the rat would find one door, say the left one, unlocked so he could swing it open. If the delay was thirty seconds, running to that door would only give him a bump on the nose when the door refused to swing. He would then have to run to the opposite door to get through to his reward of food.

It took 600 learning trials, but six out of the nine rats studied learned to tell the difference between the time intervals so that when the wait was over—whether it was ten or thirty seconds—they could run to the correct door and get their reward.

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● Earth Trembles

Information collected by Science Service from seismological observatories resulted in the location by the U. S. Coast and Geodetic Survey of the following preliminary epicenters:

Thursday, June 26, 6:52.1 a.m., EST

In Bay of Bengal, near Andaman Islands. Latitude, about 13 degrees north. Longitude, 93 degrees east.

Friday, June 27, 12:11.3 p.m., EST

On Pacific Coast of Mexico, near Guatemala. Latitude, about 16 degrees north. Longitude, 93 degrees west.

Monday, June 30, 11:50.7 p.m., PST

Off California coast. Latitude, near 33.8 degrees north. Longitude, 120.1 degrees west.

For stations cooperating with Science Service, the Coast and Geodetic Survey, and the Jesuit Seismological Association in reporting earthquakes recorded on their seismographs, see SNL, Feb. 22.

HYDROLOGY

Weather Bureau Services Cost Each U.S. Citizen Five Cents

Besides 300 First Order Stations, Nickel Maintains 40 Radiosonde Stations, 144 Wind Study Stations

SERVICES of the U. S. Weather Bureau cost each citizen an average of only five cents a year, Merrill Bernard, supervising hydrologist of the Bureau, told the Hydrology Conference at State College, Pa.

And John Citizen gets a big nickel's worth of weather, too. Among the agencies his five cents keeps at work for him throughout the year, Mr. Bernard listed the following:

About 40 radiosonde stations, sending up balloons carrying robot instrument kits, that automatically report by radio what the weather is like "up there."

Wind-study stations—144 of them—that send up small balloons, and by means of instrumental "tracking" obtain data on height, direction and velocity of air currents high aloft.

About 300 first-order stations in principal cities and at airports. These are the places you think of when you say "Weather Bureau." Meteorologists stationed there not only forecast tomorrow's weather; they collect data on rainfall, temperature, atmospheric pressure, wind, cloudiness, river stages and a lot of other things, needed by aviators, farmers, shippers and other persons whose lives are in constant critical contact with the weather.

Automatic rainfall stations, now numbering about 2,000, where precipitation is automatically measured and recorded, with only occasional human tendance.

More than 5,000 cooperative stations, manned by volunteer observers, usually working without salary. Their records fill in the gaps between the less numerous first-order stations with government-paid staffs.

Mr. Bernard also traced the history of weather study in this country, from the first systematic record, started in 1644 by the Rev. John Campanius in the old Swedish settlement near Wilmington, Del., down to the organization of the Weather Bureau as a full-fledged research and service organization, late in the nineteenth century.

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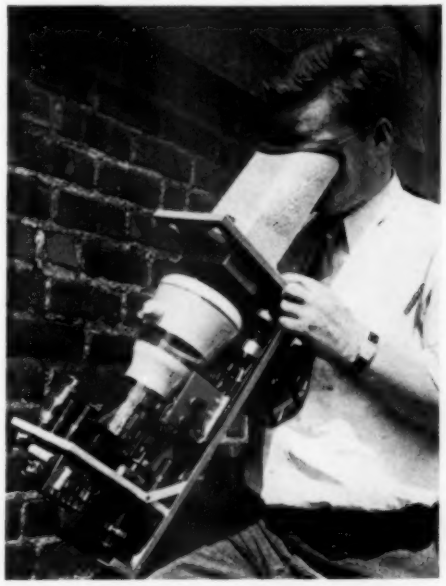

VIEW FINDER

Television cameras are now provided with a view-finder, serving the same purpose as the finder on an ordinary camera, but which actually picks up the television image being recorded, and shows it to the camera-man, looking into a light-tight hood.

Traced Through Ground

THE underground journey of water from a typical rainstorm was traced by H. S. Riesbol of the U. S. Soil Conservation Service. The fate of water sinking into the earth was learned from a study of wells sunk in the northern Appalachian region.

It took about a day, Mr. Riesbol said, for the storm water to sink into the ground. In about two and one-half days the water moved out to the drainage stream as subsurface seepage. The upper half of ground-water storage flowed into the stream in less than four days, while the remainder of the flow occupied the period between four and 45 days.

This history, of course, holds only for the locality studied. Other watersheds, in other parts of the country, would vary the story according to regional and local conditions.

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Rain Does Not Melt Snow

SNOW melts rapidly during spring rainstorms, yet contrary to popular impression the rain causes very little of the actual melting, Walter T. Wilson of the U. S. Weather Bureau told the Hydrology Conference.

During a spring rain, Mr. Wilson explained, the air near the ground is thick with water vapor, ready to condense and form dew on contact with any object only a little colder than itself. When water vapor condenses, it always gives off heat. In contact with the snow, rapid condensation takes place, with release of considerable quantities of heat, and it is this that melts the snow.

Mr. Wilson described a number of other interesting but little known phenomena to be found in melting snowbanks. As the snow partly thaws, then re-freezes at night or on colder days, the structure of the flakes within changes from fine and feathery to larger, straight-lined and coarse. Where frozen crusts were formed, then covered with later snowfall, horizontal layers of ice may be found. During thaws, these will often act as impervious strata, holding "perched water tables." Or they may melt at the top and form new ice underneath, so that they gradually sink clear through the drift and finally rest on the ground.

On the downhill edge of a melting snowdrift, the speaker continued, there will be a wet zone of soil, seldom more than ten feet wide. This is fed by water trickling out from under the snow, but evaporation prevents it from becoming wider.

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Factors in Infiltration

INFILTRATION of rainwater into the soil is governed largely by three factors, G. W. Musgrave of the U. S. Soil Conservation Service told the meeting. These factors are soil porosity, temperature, and vegetal covering. The right porous state of the soil is determined to a considerable extent by its past history. For example, a denuded soil hammered by rains may look superficially very little changed, but the pores and crevices that once welcomed the water

may have become clogged with fine particles washed in by the pounding drops. A good cover of plants, which also encourages burrowing worms and other small animal life forms, preserves and improves the soil's porosity. Temperature is important, in that it affects the viscosity of the water, and also changes the dimensions of the crevices. Below freezing point, temperature may either increase infiltration, if the soil is dry, or decrease it, if the soil is saturated and freezes in that condition.

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"Invisible River"

AN invisible river, flowing straight uphill, returns to the air a large proportion of all rain and snow that falls. Its name is Evaporation.

At the Hydrology Conference, Dr. C. W. Thornthwaite, of the U. S. Soil Conservation Service, outlined the magnitude of this skyward drainage, and told of progress in its measurement. Of one year's measured precipitation at the U. S. Department of Agriculture experimental farm at Arlington, Va., nearly half was returned to the air by evaporation from the soil surface and transpiration through the leaves of plants.

The practical importance of this way of getting rid of surplus water was suggested by the speaker:

"In central and eastern United States nearly all major flood-producing storms are terminated by invasion of relatively dry air masses of polar continental origin characterized by a thick turbulent layer and low concentrations of water vapor. These air masses provide conditions most favorable to evaporation and are able to absorb enormous quantities of moisture from the rain-drenched land.

"Since floods on large watersheds are most frequently due to general storms which must first restore to the soil reservoir water which had previously been lost by evaporation and transpiration it is evident that land use practices favoring evaporation will accordingly lessen the burden imposed on stream channels by excessive rains, both by retarding immediate run-off and by creating a water-storage capacity in the soil."

Transpiration through plants carries off much more water than direct evaporation from the soil, Dr. Thornthwaite stated. For this reason, it is desirable to encourage maximum coverage with plants of high transpiration rate, in regions subject to floods. On the other hand, in regions where drought is the main danger, it is best to promote vegetation with low transpiration rates, so as to leave as much moisture in the soil as possible.

Until recently, direct measurement of evaporation from land surfaces was so difficult that most scientists considered it impossible. Now, Dr. Thornthwaite said, intricate mathematical formulae have been worked out that can give an expression to this mode of water disappearance.

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PSYCHOLOGY

Girls' Experience Shows Hitch-Hiking Reasonably Safe

Runaways Ranging in Age From 6 Years to 105 Years Tell Their Stories to Travelers Aid Society

WHEN CHILDREN run away from home, they do so chiefly because they feel unwanted or unable to measure up to their own or their parents' standards, Dr. Lawson G. Lowrey, of New York City has found.

The major cause of children's running away from home as found by the psychiatrist differs from causes listed by police department reports and the "most intriguing" stories told by the children to Travelers Aid Society workers.

Girls made up 44% of the group studied. According to their experience, "hitch-hiking seems to be reasonably safe," Dr. Lowrey stated. Favorite story told by the girls when asking the Travelers Aid Society for help in finding an inexpensive room runs as follows:

"Their parents had recently died; they have no family of any sort; they have come to New York to embark on a glamorous career in the theatre, movies, or dancing."

"The boys are clumsier with their stories but usually more convincing," Dr. Lowrey said.

The runaways studied ranged in age from 6 years to 105 years. For the most part they were running away from something unpleasant, to a situation "which they hope will be a better one in a variety of ways." Most of the runaways did not have psychiatric abnormalities.

"Nomads present a somewhat different picture," he said. "Many of these are competent workers, who have little difficulty in securing a job, but do have difficulty in holding one. Many of them present paranoid types of personality, such that they are under some compulsion to reorganize any job they have. They commonly give histories of having been on the road for a number of years, unable to remain long in one place because of their paranoid tendencies.

"One man, 105 years of age, had come on to New York from California to get financial backing for a mine. He had been a prospector for many years, he claimed, but was also interested in promoting a cancer cure and a tuberculosis cure. His small pension was enough for him to live on, but he had wandered away some four or five times during the past six years, always in pursuit of some type of business adventure. There was no evidence of senile deterioration."

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MEDICINE

Hayfever Cause Extracted From Ragweed Pollen

EXTRACTION from ragweed pollen of a colorless, nitrogen-containing chemical believed to be one of the major causes of hayfever was announced by Prof. Harold A. Abramson and Dr. D. H. Moore of the Columbia University School of Medicine and Dr. H. H. Gettner of Mount Sinai Hospital, New York City, at the Wilder D. Bancroft Colloid Symposium held at Cornell University under the auspices of the National Research Council and the American Chemical Society.

The molecular weight of the chemical was found to be "surprisingly low—only 5,000," Prof. Abramson reported.

This small size is significant, it appears, from his explanation that in order to produce hayfever, pollen must not only be blown into the nose and eyes but the molecules causing the symptoms must pass through the mucous membranes into the deeper tissues beneath.

"Our study indicates that the ease

with which allergic individuals will become sensitized to the content of pollen grains may depend to a great extent upon the small size of the allergenic molecules which have now been isolated and studied quantitatively by electrophoresis, by ultracentrifugation, and by diffusion experiments for the first time," Dr. Abramson declared.

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PHYSICS—AERONAUTICS

Three Inches of Safety Glass Shields Fliers from Bullets

Blow of Bullet Shatters and Even Powders Glass Around Point of Impact But It Is Unable to Penetrate

BULLET-PROOF safety glass three inches thick, used as protection for fliers in war planes, stops even the heavy bullets of .50 caliber machine guns, hitting it squarely at right angles at a range of only 100 yards, states Horace J. Alter, aeronautical engineer. (*Army Ordnance, March-April*). Bullets of the regular rifle-caliber machine guns are stopped by two inches of the same kind of glass.

The blow of a bullet shatters and even powders the glass around the point of impact, but the missile dissipates its energy in friction and is unable to penetrate, Mr. Alter reports. Since airplane windshields are always streamlined, and hence present a sloping surface to an attacker's fire, less than the thicknesses named will practically always suffice for protection.

Steel plates, used beneath and back of the flier, to protect him against ground fire and from fighting planes that "get on his tail," may have to go up to half-inch thickness as heavier-caliber machine guns are mounted on fighters. Plates of this thickness will turn .50-caliber bullets at all angles greater than 20 degrees' departure from right-angle impact.

Necessity for armoring planes will probably force crews and vital equipment into ever more compact arrangement, since every square foot that has to be protected adds pounds of dead weight to the plane's load.

Utilization of other structures for incidental protective function is urged by Mr. Alter. Wheels in the retracted position can be so arranged as to cover part of the fuel tanks, preventing bullets and shell-splinters from puncturing their bottoms. Surfaces of internal bracing members can be sloped to deflect bullets and cause them to tumble, thus robbing them of power to penetrate.

Need for armor protection began to be realized by fliers during the first World War, as soon as they found themselves under fire. They improvised as well as they could, putting stove-lids under their seat cushions, and fastening pieces of steel shields from disabled field guns on the backs of their seats. After the war, designers of military planes tended to dodge the question of armor because they hated to add weight. But now, under the lash of deadly necessity, they are again working armor protection into their plans.

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MEDICINE

First-Aid Information Against War Gases

AMERICANS are still fortunately not in immediate danger from war gases but many of them, remembering first-hand experiences with this chemical warfare weapon in World War I, have been wondering why so little has been heard about anti-gas measures in our plans for total defense. As if in answer, there comes the first American edition of the British *Medical Manual of Chemical Warfare*. (*Reviewed, SNL, this issue.*)

The book is intended primarily for medical officers of the Army and Navy and the air branches of these services. It is, therefore, rather too technical for general lay reading, although thorough-going first-aiders may find it worth studying. As is emphasized in the foreword, "speedy recognition of the type of gas which has caused casualties is essential for rapid diagnosis and efficient treatment; these desiderata can only be obtained by timely and thorough knowledge of chemical warfare substances, their characteristics and their effects on the human body."

According to this manual, the old war gases, such as chlorine and phosgene are not likely to be used. Mustard gas, being more versatile and more subject to novelty in its use, may be employed, it is believed. It may be sprayed from aircraft directly on troops, or mustard gas air bombs, along with high explosive or incendiary bombs, may be dropped on buildings, encampments and industrial centers.

One of the gravest dangers of liquid mustard gas is that of damage to the eyes. The immediate discomfort may be slight and brief, but within an hour or so the eye will be inflamed and the lids swollen and painful. Ulceration of the cornea and loss of vision may result if proper treatment is not given. Special eye shields or suitable gas masks will protect the eyes. If these are not worn, immediate preventive treatment should be used even if only a very small drop of mustard gas liquid gets into an eye. Recommended preventive treatment is thorough immediate washing of the eyeball and the insides of the lids with plain water from a water bottle. An eye cup, syringe or dropper will help in this process. The washing-out should be thorough and repeated hourly.

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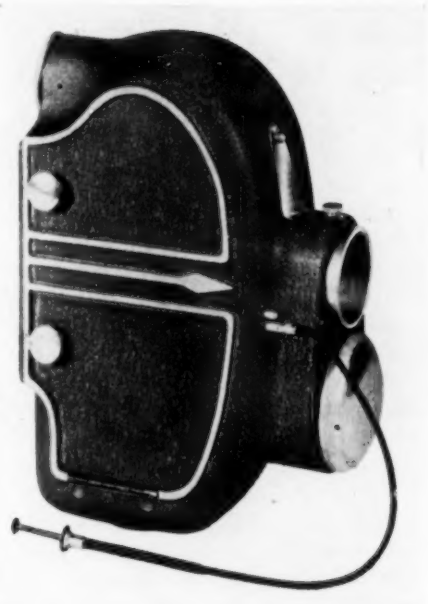


FOR PHYSICIANS

With this camera, and its battery of attachments, physicians and surgeons may make color or black-and-white photographs of their cases. A flash bulb is located below the lens, and is operated in synchronism with the exposure. If desired, the bulb may be fired in a separate reflector, several feet away. A tubular attachment may be used to take photographs in the mouth, for example, the light being reflected to the point desired. (Cameron Surgical Specialty Co.)

PUBLIC HEALTH

Endemic Typhus Fever Reported in Ohio

FOR the first time, cases of endemic typhus fever have been reported in Ohio. Dr. George W. Stober, health officer of East Cleveland, reports one case in the Ohio State Medical Journal, and the U. S. Public Health Service, which sent a representative from Washington to investigate, states that two other cases have been reported elsewhere in the state.

Endemic typhus fever, which is spread by rat fleas, has been creeping slowly and steadily northward, federal health officials state. Cases have previously been reported in central Tennessee.

It is believed the Cleveland patient was bitten by a flea from a rat that had come from the South on a food truck or railroad car. Improved transportation facilities and increased movement of goods caused by the defense program will bring added health hazards of this nature, the Ohio State Medical Association warns.

European typhus fever, which occurs in epidemics, is transmitted by the human body louse.

Science News Letter, July 12, 1941

PHYSIOLOGY

Life Is Lived in Water, Not in the Atmosphere

NOW that hot weather is here again, most of us are thirstier and drink more water, and also try to keep cool and comfortable by more frequent immersions in water, whether in the tub, swimming pool or ocean. But even while doing our best to become amphibians again, we probably fail to realize that life, which started in the water, "is still lived in the water, not as we fondly imagine, in the air."

This fact is pointed out by Prof. William Boyd, of the University of Toronto, in the latest edition of a textbook for nurses, *An Introduction to Medical Science*. (*Reviewed, SNL, this issue.*)

"Of course, the air is all around us, but," explains Prof. Boyd, "the surface of the body in contact with the air is either dead (the horny layers of the skin) or is separated from the air by a layer of water (eyes, nose and mouth)."

All the tissue of the body, bones and muscles and glands and nerves, are made up of cells and these cells are all living, eating, drinking units of life. They are bathed in a salty fluid, called tissue fluid, without which they cannot live. This tissue fluid is a lake, not a stream, Prof. Boyd points out. The blood also contains fluid, the plasma and serum, but the blood and its fluid move like a stream through the body, propelled by the force of the heart's contractions.

The fluid of the blood stream passes through the thin walls of the tiniest blood vessels, called capillaries, into the tissue fluid lake, bringing into it food and oxygen for the cells. The blood goes back to the heart and lungs via the veins, but the tissue fluid, which is continually being added to, drains its excess with waste products from the living cells into the lymph fluid. The latter, like the blood, travels through vessels or pipes, called lymphatics, and after passing through several filters (the lymphatic glands or lymph nodes) which strain out and generally destroy injurious substances, gets into the veins.

In certain diseases like cholera or others associated with severe vomiting and diarrhea, and even after a night of hard alcoholic drinking, the tissue fluid lake may be drained so fast that a condition like drought occurs. Doctors call this drought in the body dehydration. Just as plants die when there is a drought in the land, body cells die during severe dehydration. To relieve the body's drought, doctors generally inject salt solution.

Science News Letter, July 12, 1941

ENTOMOLOGY

"Death Ray" for Roaches; Not Ready for Home Use

SCIENTISTS have demonstrated a death ray that may prove a blessing to sanitation. Infra-red rays produced by a special incandescent lamp were turned on adult cockroaches. Those within eighteen inches of the invisible rays were pronounced dead by the executioner four minutes later.

Dr. Guy F. MacLeod, lecturer in entomology in the University of California College of Agriculture, reported these results of laboratory experiments on cockroaches, but could offer no practical method, so far, of using the rays on the pests in household or restaurant kitchens.

Infra-red rays were also tried on various plant pests which are not only an annoyance to agriculturalists but destroy millions of dollars worth of crops annually. Unfortunately, the plants were injured or killed by the rays before the infesting insects were killed.

Science News Letter, July 12, 1941

IN SCIENCE

HERPETOLOGY

Despite His "Jug-o'-Rum" Bullfrog Prefers Water

See Front Cover

SUMMER nights echo with the calls of frogs, with the diapason of the bullfrog's largely fanciful demand for "jug-o'-rum" loudest of all. Actually, this interpretation on the part of frivolous human beings is a libel; the bullfrog is more completely addicted to water than even the most austere temperance advocate. Keep him away from it too long, when the sun is shining on his green back, and he will surely die. Like most of his batrachian brethren, he is exceedingly thin-skinned, and rapid evaporation with no opportunity to check it by frequent and total immersion is a source of discomfort and danger to him.

The photograph on the front cover is by George A. Smith of Quarryville, Pa.

Science News Letter, July 12, 1941

MILITARY SCIENCE

Medal Awarded to Garand, Inventor of Army's Rifle

JOHN C. GARAND, inventor of U. S. Army's new semi-automatic rifle, has been awarded the Brig. Gen. John H. Rice Medal for meritorious service to armament engineering, by the Army Ordnance Association. First tested in 1931, this weapon is now in mass production to meet the needs of the rapidly expanding armed forces of this country.

Two other medals have also been awarded by the Army Ordnance Association. The Col. Frank A. Scott Medal goes to Col. Herbert W. Alden, chairman of the Ordnance Automotive Advisory Committee, in recognition of pioneer work in the development of tanks and other combat vehicles. The Maj. Gen. William Crozier Medal is designated for Col. James L. Walsh of New York, founder and first editor of the Association's Journal, *Army Ordnance*.

Formal presentation of the medals will be made in the autumn.

Science News Letter, July 12, 1941

NCE FIELDS

GENETICS

Sulfanilamide Acts Like Colchicine in Plant Study

SULFANILAMIDE, medical science's newest germ-killer, has appeared in an entirely different role in experiments on plants at the Beltsville, Md., laboratories of the U. S. Department of Agriculture. There, Dr. H. P. Traub of the Bureau of Plant Industry has found that solutions of sulfanilamide and related sulfa drugs act like colchicine in speeding up evolutionary changes in plants.

The effects, both macroscopic and microscopic, seem to parallel quite closely those of colchicine. There was a great increase in size of plant parts, all the way from leaves to pollen grains. Under the microscope, cells in root tips were seen to have double the normal number of chromosomes.

Whether these results of sulfanilamide treatment establish themselves permanently in the plants' heredity is not yet established. Further investigations are in progress.

Science News Letter, July 12, 1941

ARCHAEOLOGY

Surveys Ancient Ruins While Nazis Blast Others

REVEALED in the British journal *Antiquity* (June) is a new story of the famed British morale. In the thick of the Battle of Britain last September, flying archaeologist O. G. S. Crawford, by arrangement with the Air Ministry, undertook an aerial survey of ancient buried ruins of the Roman city of Verulamium near St. Albans.

Rare weather conditions, so favorable for air photography that they may not occur again in years, provided the emergency reason for the scientific flight.

Prolonged drought in August scorched grass now growing over part of the Roman city, causing brown streaks to form with unusual plainness on tennis courts and cricket grounds there. These streaks reveal a chess-board plan of the buried Roman city, its streets and buildings. Photographed from 3,000 feet, the scorched field has added new features to archaeological knowledge of one of ancient Britain's outstanding cities.

A widening of the ancient east-west road of the city formed what may have been a parking area of the second century A.D., Philip Corder, curator of the Verulamium Museum, reports from study of the air views. The plan of a small Romano-Celtic temple and evidence of many other buildings are disclosed.

Seizing the opportunity to record what the dry weather brought to light, British archaeologists hope to excavate in this part of the site when scientific discovery can be resumed. Prior to the war, excavations at Verulamium had been in progress for about 10 years.

Science News Letter, July 12, 1941

HOME ECONOMICS

Hosiery Design Dictionary To Aid Stocking Makers

A DICTIONARY of hosiery designs, first of its kind produced, is the invention of the U. S. Bureau of Home Economics to aid makers of cotton stockings in planning styles.

Mrs. Bess V. Morrison of the Bureau's clothing and textile division described the new stocking dictionary to the American Home Economics Association meeting in Chicago. When complete it will consist of over 200 knitted samples of designs for women's cotton hose, she explained. Copies are to be filed with the Textile Cotton Institute and the Mercerizers' Association of America in New York, where manufacturers can consult them.

Suitable work garments for women on farms and in industry are also being developed by the Bureau's clothing experts, and a style show of these work fashions was presented by models. Farm women, said Mrs. Morrison, have never had garments designed for them, suited to their work of gardening, tending chickens and doing other farm chores.

It has been well known, she said, that unsuitable clothing may be a cause of accidents to women doing farm and factory work. Proper clothing designs will contribute to safety, efficiency, and conservation of energy, she predicted.

Health angles of wearing various types of stockings are also being tested by the Bureau's workers. Testing cotton and silk hosiery, the research workers hope to learn more about their effects on the skin, such as perspiration and the giving off of bodily heat.

Science News Letter, July 12, 1941

AERONAUTICS

Daily Transatlantic Air Service Urged

DECLARING that the "existing Atlantic commercial air services have proved totally inadequate," daily, and even twice-daily, flights are urged in an editorial in the British aviation weekly, *Flight* (June 5).

"The number of people to whom time is all-important is considerable now, and will grow rapidly as our association with the United States increases in volume and closeness," says the writer. "At the very least there should be a daily service, and the time will probably come when a service every 12 hours will be assured of a full load on every trip."

Though disclaiming any desire "to 'lay down the law' in what our good friends on the other side may well regard as purely family affairs," the writer suggests that common interests may indicate that the United States aid in the matter of transatlantic commercial services "as they have done so splendidly in connection with armaments."

It is also said that the announcement that Air France is to resume its service to South America, presumably from Dakar, "is virtually giving Germany an opportunity which Great Britain cannot view with indifference, and which even the United States, after Mr. Roosevelt's speech, must regard as something of a threat."

Science News Letter, July 12, 1941

ENTOMOLOGY

Two Leading Insect Sprays More Effective as Fumigants

FUMIGATION with a smoke or fog of rotenone or pyrethrum, two favorite insect-spray poisons, has proved much more efficient than spraying, W. N. Sullivan and L. D. Goodhue, scientists in the U. S. Department of Agriculture laboratories, have discovered.

Since these two compounds are harmless to man and domestic animals, their use as fumigants offers advantages over fumigants now in use, such as hydrocyanic acid, which are dangerous poisons to human beings as well as to insects. To produce these smokes or "aerosols" of rotenone and pyrethrum it is necessary to use high temperatures, spraying their solutions against an electrically heated plate. Once produced, however, such aerosols are very persistent, hanging in the air for hours.

Science News Letter, July 12, 1941

ASTRONOMY

Any Life on Venus Is Declared Impossible

Clouds That Perpetually Veil Surface of Planet Are Believed To Be Composed of Solid Formaldehyde

LIFE on the planet Venus, under the clouds that perpetually veil its surface, seems impossible, as a result of studies by Dr. Rupert Wildt of the Princeton University Observatory. Dr. Wildt, who showed that Jupiter and Saturn are surrounded by clouds of ammonia, and that the atmosphere of these planets also contains methane, has advanced the theory that the clouds of Venus are solidified formaldehyde. This is a poisonous and extremely irritating gas often used as a disinfectant because of its germ-killing powers.

His results were announced in the *Astrophysical Journal*. In this he proposes a theory to explain the origin of the formaldehyde and why it is not present in the atmosphere of the earth.

According to a suggestion made in 1924 by a German scientist named Gustav Tammann, oxygen in our atmosphere originated when the surface of earth was in a molten state. The high temperatures, it is believed, caused the water vapor to break up into hydrogen and oxygen. The molecules of the former are in such rapid motion that they would have escaped into space. Some of the oxygen would have united chemically with the still molten crustal material. When this cooled and hardened some of the oxygen was left in the air.

On Venus, proposes Dr. Wildt, there was originally a considerably smaller quantity of water vapor than on earth. Then, he believes, the oxygen would be used up as fast as it formed, and when the crust solidified, there would be a thin atmosphere of water vapor remaining.

Without earth's protection by its oxygen, the ultraviolet light from the sun would be much more intense. This would cause a reaction between the water vapor and the carbon dioxide which has actually been found in the atmosphere of Venus. Result would be the formation of formaldehyde and liberation of more oxygen.

But this, like the earlier supply, might also be used up as it unites with the crust. When all water vapor had been used up, the process would stop.

In the spring of 1940, while visiting the McDonald Observatory in Texas, Dr. Wildt made observations of Venus, comparing it with the airless moon, in an attempt to detect by the spectroscope formaldehyde in its atmosphere. Though if it were about a third of one per cent as dense as our atmosphere it would have produced an effect, none was found. This, however, does not invalidate the theory, he states.

Formaldehyde molecules very readily combine into larger molecules, called "polyoxymethylenes," which are white solids. Therefore, he suggests that this was the fate of the gaseous formaldehyde. These polyoxymethylenes also combine with water, so if any water vapor remained they would have taken up the last of it. He refers to an experiment in which a minute amount of water vapor is injected into a jar of absolutely dry formaldehyde gas, made of single molecules. The jar is immediately filled with a cloud of the solid material in finely divided form. This, he suggests, is the composition of the clouds over Venus.

If this is the case there would still, in all probability, be enough free formaldehyde on the surface of Venus to make it most unpleasant, while the complete lack of oxygen would preclude the possibility of life.

Science News Letter, July 12, 1941

PUBLIC HEALTH

Syphilis Rate in Draft One-Seventh That in 1917

ENCOURAGEMENT to finish the nation-wide fight to wipe out syphilis and gonorrhea appears in the U. S. Public Health Service announcement that among young men called for Selective Service training in 1940-1941 there were only one-seventh the number of cases of syphilis and only one-third the number of gonorrhea cases found in the 1917-1918 World War draftees.

Among the first 1,070,000 men examined by Selective Service boards, there were 48,000 cases of syphilis. Of these, 1,500 had early syphilis that could be detected without a blood test. This gives a rate of about 15 per 10,000 men. The World War draft figure for early syphilis detectable without blood tests was about 105 per 10,000 men. The gonorrhea rate in this group is about 150 per 10,000 men. In 1917-1918 it was about 430 per 10,000.

Estimated syphilis rate for the entire population, on the basis of these figures, is about one and one-half to two per cent. This is slightly higher than previous Public Health Service estimates, Dr. R. A. Vonderlehr, in charge of the Service's venereal disease division, said, but the rate among young men of Selective Service age is much lower than was expected.

Rates by states show that syphilis is far less prevalent among the wealthier states which have been able to continue venereal disease prevention work uninterruptedly since 1917.

Science News Letter, July 12, 1941

BIOCHEMISTRY

Synthetic Starch Made By Enzyme Acting on Glucose

STARCH has been synthetically made from glucose in the University of California laboratories by Dr W. Z. Hassid and R. M. McCready. This is the first case on record of the production of starch by any means except the action of plants themselves.

The reaction was brought about with the aid of an enzyme known as phosphorylase, which the two scientists isolated from potato juice. In its presence, glucose first combined with phosphoric acid (a compound occurring in all green plants) to form a substance called phosphorylated glucose. The enzyme then broke this compound down into its original constituents, glucose and phosphoric acid, and recombined the glucose molecules into starch.

The total amount of synthetic starch thus far prepared by Dr. Hassid and Mr. McCready is only 40 grams, or 1.4 ounces. It is not absolutely identical with natural starch, but resembles it so closely in chemical and physical properties that the differences are not significant.

Starch is produced so cheaply by plants that no industrial use is anticipated for the new synthesizing process. It is of high significance, however, as a step in advance in scientific knowledge of the way plants work.

Science News Letter, July 12, 1941

CHEMISTRY

Water

Fluid Which Makes Up Most of Earth's Surface and Life on It Is Full of Big Holes of Empty Space

ALL life on earth, chemically, involves reactions of water solutions. Any human being is two-thirds water. Approximately 78 per cent of the brain is water. The muscles with which man moves are 75 per cent water; even his teeth are one-tenth water and his bones one-sixth. The earth itself—at least its surface and possibly to some distance into its interior—is composed in part of this same water in various forms. It covers three-fourths of the outside of the globe.

Since water is of such basic character, a complete understanding of the structure and properties of this liquid is essential, but only within the past few years has much light been shed on these.

There is intoxicating water, exploding water, sour water, water that will burn through glass or steel, solid water —all forms, actual or theoretical, of pure water. By its supreme solvent powers it spreads chemical action through the earth's crust. It is the active agent in volcanoes. It dissolves materials and transports them to concentrated deposits, available to man. It washes the surface of the earth into the oceans, which give it back again, millenniums later, as limestone and other deposits.

Much remains to be learned and much that has been determined has yet to be correlated into a consistent picture. Why is this liquid so near to being an ideal solvent and how do its properties in this respect change with changing physical conditions? These are subjects of intensive study at present at the Geophysical Laboratory of the Carnegie Institution of Washington.

Concept Has Changed

During the past few years the concept of the nature of liquids, as distinguished from gases and solids, has undergone revolutionary changes.

All three are composed of much the same kinds of molecules. In gases these are comparatively far apart and are distributed at random. In solids they are very close together and arranged in definite orders. A gas can be changed into a solid by bringing its molecules near each other, by means of cooling or pressure, so that they will be arranged in stable patterns by the distribution of their own attractive forces. Likewise a solid can be changed into a gas by heating—that is, by imparting to those molecules sufficient energy to break loose from these attraction bonds—or by release of pressure.

But in either direction this transformation usually passes through a liquid phase. Liquids used to be considered as gases in which the molecules had come very close together but were not yet arranged in any definite order.

This concept has been somewhat revised from studying the way in which X-rays are scattered in passing through a liquid, which in turn indicates the distribution of the molecules.

A liquid is now considered in some respects not as a compressed gas but as a melted solid—perhaps a hair-splitting difference, but of considerable significance in interpreting liquid behavior. The properties of a liquid now can be seen to depend on the "neighborliness" of its molecules and the nature of the spaces between them.

Water Is Unique

In these respects water is unique in nature. The molecule may be pictured as a sphere with electrical charges at four points which are the vertices of a tetrahedron. Two of these charges are positive and two negative. When these spheres are placed in contact so that the positive poles of one touch the negative poles of the other, there is built up a structure in which each water molecule is surrounded by four nearest neighbors. This makes the structure a very open one. Molecules arranged in such a fashion trap a lot of empty space. In other words, water is full of big holes.

Ordinarily when a liquid is heated it expands. The molecules are given more energy of motion and tend to get farther apart. But when they are arranged in the water structure and given more energy, the effect is quite complicated. They tear away from their positions in the structure, but there is no way in which they can arrange themselves easily which provides more space between them. Distorting the structure actually produces a tendency toward contraction. But at the same time these molecules share with those of other liquids the tendency to get away from each other as their energy is increased.

Thus there is set up a tug-of-war between the two tendencies of contraction and expansion. If the temperature is increased sufficiently the expansion drive wins and the liquid becomes steam. But at low temperatures the expansion is very little. Between zero and 25°C it is only a fourth of what would be expected of a normal liquid. At temperatures close to freezing the contraction becomes predominant, and there is actually contraction between zero and 4°C. This is one of the most important facts in nature. It means that as water reaches the solid, or ice, stage it is lighter, volume for volume, than at slightly above freezing. So ice floats, lakes freeze from above downward.

Why It Is Good Solvent

The open structure of water explains its properties as a solvent. Small, positively charged ions, such as those of lithium and magnesium, can get into the space between four firmly bound water molecules and, by repelling the positive poles, tend to increase the volume. The larger sodium and potassium ions, on the other hand, tend to pull the water molecules closer together.

There are at least 18 kinds of pure water. For a decade the familiar chemical H_2O, a molecule made up of two atoms of hydrogen and one of oxygen, has meant only the most abundant and best-known water existing in nature.

There are three isotopes (forms with different weights) of the hydrogen atom. One, deuterium, is twice the weight and another, tritium, thrice the weight of ordinary hydrogen. These three can be combined in all possible combinations of two to form water.

There are also three isotopes of the oxygen atom—O_{16}, O_{17}, and O_{18}. Regardless of which isotope is combined with the two hydrogen atoms, water is formed.

Only one of the variants from ordinary water is well known to physicists: the so called "heavy water," composed of two atoms of deuterium and one of oxygen 16. This has been prepared approximately 99 per cent pure and displays peculiar properties now under investi-

gation in many laboratories.

Tritium, or triple weight hydrogen, is a radioactive element. Half of it explodes every 250 days. Since the amount originally present on earth has decreased by half approximately every year since the coo ing of the planet, only an infinitesimal amount of it can be left. Nevertheless, it can be assumed, there is an occasional atom combined with some form of oxygen to form a molecule of water. Hence there may be "exploding water."

As the earth grows older, probably the amount of deuterium relative to the amount of ordinary hydrogen increases because, being heavier, it is less apt to escape into space.

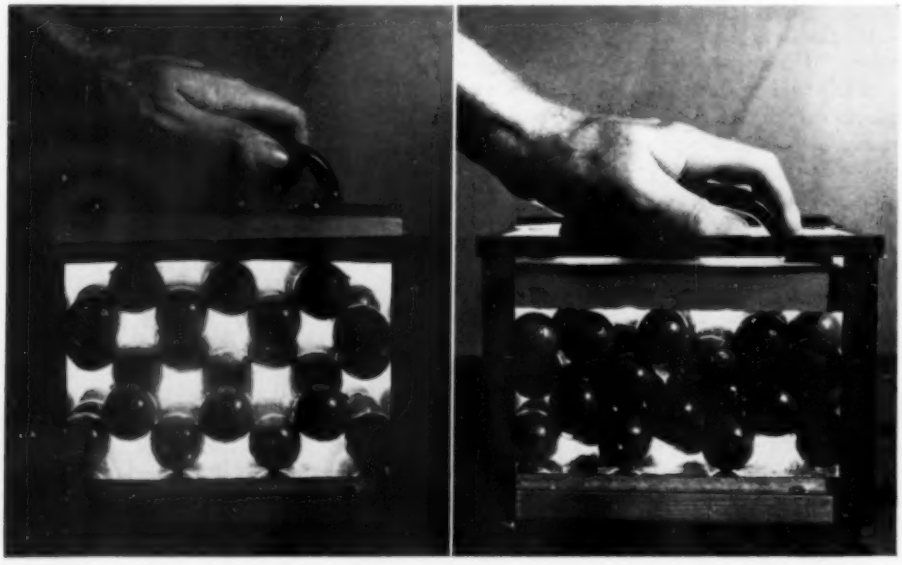
Chemically the properties of the 18 kinds of water presumably are identical. Physically and physiologically there may be wide variations. The heavier the water in protoplasm, it was thought at first, the slower would be the complex phenomena of life. Hence DDO (heavy water) was the subject of some speculation as a possible prolonger of existence.

A problem of great theoretical interest concerns the practical possibility of changing water into "glass," that is, into a non-crystalline solid. When water crystallizes to form ice, usually at zero centigrade, it increases in volume. Now every cell of every living thing contains water. When this freezes the expansion presumably breaks the cell walls. The result is death of the cells and, if the process is wide-spread, death of the individual. But if the cell water could be solidified without increasing its volume, life processes might be suspended indefinitely without being brought to an end.

It has not been actually demonstrated that death from freezing is due to bursting of cell walls because of the expansion of water. Other life mechanisms are affected and it is possible that changes in some of these, such as salt concentration, due to rapid freezing may explain the reported phenomenon.

This much can be said: water does not necessarily change into ice at zero centigrade. It has been brought down to the neighborhood of minus 24° and remained liquid. There must be a nucleus around which crystallization starts. This may be a speck of impurity in the liquid, or a motion. If absolutely pure water could be kept absolutely motionless it is difficult to say how low a temperature cou'd be achieved without freezing.

The super-cooled water presumably is a little more viscous—that is, a little thicker—than ordinary water, although the difference is not superficially discernible. Presumably as the temperature sank lower and lower it would pass through the consistenecy of molasses and finally glass. There would be no increase in volume.



WHAT PRESSURE DOES TO WATER

These two photographs illustrate how the molecules are arranged in liquid water at low temperatures (left) and what happens (right) when the water is squeezed by enormous pressure. Each ball represents one water molecule, and each is joined to four neighbors by weak forces (rubber bands in the model). These illustrate that, although water is usually regarded as a very incompressible substance, it would be even more incompressible if the molecules were not arranged in this unique way.

In the earth's interior, there is water at very high temperatures and under very great pressures. The properties of this form of water are the particular interest of Dr. R. E. Gibson and his associates at the Geophysical Laboratory. Upon such properties depend some of the phenomena of volcanology.

It is known that the greater the pressure, the more corrosive water becomes. Under very high pressures, combined with high temperatures such as would be encountered 40 or 50 miles below the surface, it would eat its way through the walls of almost any imaginable container. Its acidity increases under pressure.

A strange form is "liquid steam." This is water far above the boiling point—100° centigrade at sea-level pressures—where it normally evaporates.

It can be kept a liquid, or at least something superficially indistinguishable from a liquid, at temperatures of from 500 to 600°C by increasing the pressure upon it as the heat is increased. Such actual temperatures have never been obtained because, apart from the technical difficulties involved, water at such pressures would be transformed into an acid that would eat its way through walls of steel a foot thick.

Exists at Great Depths

Certainly such water exists at great depths. A predominating proportion of the gases emitted in a volcanic eruption are "water." It differs from ordinary water largely because of the changes produced in its internal structure by enormous pressures. In the Carnegie laboratory it can be placed under pressures thousands of times that of the sea-level atmosphere.

As the pressure increases, the curious arrangement of its molecules in groups of five, with four arranged at equal distances about one vibrating in the center, tends to be changed into the 12-in-a-pile structure of most other liquids.

The solubility increases as the pressure goes up, in spite of the fact that there are smaller and smaller "holes" for the foreign substance. This is due, Dr. Gibson says, to the fact that a group of water molecules at ordinary pressures seems to constitute a very self-satisfied population group. But as the structure is changed, the "happy family" arrangement comes to an end and the molecules begin actively to draw to themselves the foreign particles, despite the fact that there is less room for them.

ENGINEERING

Standards Adopted for Technical Abbreviations

Elimination of Periods and Spaces in Printing Familiar Short Forms Will Save Space and Work

BY eliminating the use of periods and spaces in abbreviations for technical units, considerable space will be saved in printing many engineering papers, the American Standards Association has decided, in adopting new and official forms for these shortcuts. Having standard abbreviations, it is hoped, possibility of misunderstanding in defense and other important work will be lessened.

Formerly, for example, "revolutions per minute" was abbreviated as "r. p. m.," but the Association decided that "rpm" was perfectly clear and much simpler. But even though this principle was adopted in a list prepared in 1932, spaces were used. "Pounds per square inch," frequently used in connection with steam pressure for instance, was given as "lb per sq in." However, in typesetting, this requires thirteen operations in operating the typesetting machine to put in the letters, spaces, and the single period. The new abbreviation is simply "psi," which only requires the operator to strike three keys. Frequently, in the past, the diagonal line (/) was used instead of "per", as "lbs/sq in." This is now frowned upon.

Also discarded is the degree sign (°) for temperature. Instead of writing, for 95 degrees Fahrenheit, "95° F," the proper way now is simply to write "95 F" as it is felt that the context is usually enough to explain what is meant, and that the reader would know that the numbers refer to degrees.

However, the committee which made these decisions felt that there might be danger of confusion where the abbreviated form was the same as a common English word, like "in" for inches, "log" for logarithm, "bar" for barometer, and it has sanctioned the use of periods in these cases. Evidently this was done against the wishes of the chairman of the committee, George A. Stetson, for he says in the Association's journal, *Industrial Standardization* (April):

"Perhaps a later revision will find the committee in a mood to trust to the intelligence of readers who are bright enough to know that log 303 probably does not refer to the number of sticks in a cord of wood, and who may be trusted also to interpret 29.92 in bar as a measure of the barometric pressure and not the number of persons making up a cocktail party."

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SCIENCE NEWS LETTER

2101 Constitution Ave. Washington, D. C.

NAVAL SCIENCE

New Weapons Alike in "Growing Pains" Period

THE INTRODUCTION of any new weapon, or any new defensive means, in the highly competitive art of war, appears always to bring on a period of instability, marked by constant revisions upward. This makes for rapid obsolescence of earlier models, entailing terrific expense on the part of powers that undertake to keep themselves completely armed. The development may eventually terminate in a period of relative stability, during which constant improvements may be made, but not such as to render wholly useless devices already in use.

Airplanes and their associated weapons are at present in the state of rapid development and rapid obsolescence. We are used to the phenomenon of the plane that was the speediest, the fastest climbing, the farthest ranging, the most heavily armed only a year or two ago being now only second or third best, and hence regarded generally as only a piece of flying junk.

This is very closely parallel to what happened in the development of the battleship, it is pointed out in a new book, *Sea Power in the Machine Age*, by Dr. Bernard Brodie (*Reviewed, SNL, this issue*). The naval rivalry between England and France in the middle of the nineteenth century, though they never came to blows, was curiously like the present deadly rivalry between Britain and Germany in the air.

The first ironclad was a French ship, *La Gloire*, built by the French in 1859, and "answered" very promptly by England. (Contrary to popular impression in this country, the Merrimac and Monitor were not the first armored warships; they were only the first two that happened to get into a fight with each other.) These early ironclads started out, modestly enough, with about four inches of wrought-iron armor. Heavier guns were of course immediately introduced, to smash it. Thicker iron and bigger cannonballs argued it out for a dozen years, until the warships of the seventies carried iron belts as much as two feet thick.

Presently steel armor was introduced, and since then battleship armor, though still massive, has never become quite so ponderous. By now a battleship a quarter of a century old is regarded as still serviceable, whereas a plane a fifth of that age is almost a museum piece. One is left wondering how long it will take for aircraft to get over their growing pains and settle down.

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● RADIO

Thursday, July 17, 2:45 p.m. EST

On "Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Brigadier General William A. McCain, Commanding Officer, Philadelphia Quartermaster Depot, will discuss "Clothing the Army."

Listen in each Thursday.

ESSAYS ON THE NEW VORTEX ATOM

by Carl F. Krafft

The author maintains that the atom does not have any nucleus as taught by the physics authorities of today, but only a structural center. Many diagrams of actual atomic structures are presented.

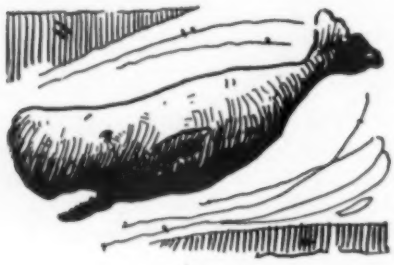
Hundreds of physics and chemistry teachers have already obtained copies, and all of their responses have been favorable. Not a single adverse comment has been received.

Free upon request

C. F. Krafft, 2510 Q St. N. W., Wash., D. C.

MARINE BIOLOGY

NATURE RAMBLINGS by Frank Thone



Plankton

PLANKTON, the swarming minute plant and animal life of the sea that is the basic food of all fishes and even of gigantic whales, is recommended for trial as an emergency ration in Britain. The recommendation is made by Prof. A. C. Hardy of University College, Hull. (*Nature*, June 7).

Plankton consists of minute, free-floating organisms, some of them microscopic, some visible to the naked eye, but none big enough to be counted a mouthful by anything larger than a shrimp or a sardine. In the ocean's great food cycle, larger forms in the plankton eat the tiniest, then are themselves eaten, until the ultimate eaters are the fish that come to our tables. The whalebone whales short-circuit this eat-and-be-eaten cycle by engulfing enormous quantities of sea water in their great mouths and straining out the water through the fringy sieves of whalebone. They thus live directly on plankton; and Prof. Hardy points out that they seem to do right well on this natural, uncooked soup, for they grow from infancy to their enormous adulthood in only two years.

Before the war, Prof. Hardy states, scientists at the German marine biological station on Heligoland were looking into the dietetic possibilities of plankton. They found that the masses of tiny animals in the plankton had a nutritive value equal to the best meat and the plants to be equal to rye flour. Protein and fat contents were especially high.

To get the plankton out of the sea and on to the dining table is a task not too easily solved, for while there are billions of these creatures under every square mile of sea surface, they are after all rather scattered. Towing enlarged versions of the ordinary scientific collector's plankton nets behind boats does not look economically feasible, when boat hire, fuel expenditure, crew's wages and general overhead have to be reckoned against market value.

However, Prof. Hardy suggests, it might be possible to anchor long funnel-shaped nets in certain channels along the coast, where plankton-laden tidal currents run strongly. A whole "fleet" of these nets could be tended by a couple of men in a small power boat, who would merely lift the closed ends of the nets, untie collecting vessels from them, tie in empty collectors and drop them into the sea again.

He calculates that twenty men, tending a hundred such nets, could bring in daily 26¼ tons (dry weight) of high-class food. The factories for processing it could be located on convenient points along the shore.

"Such a war-time emergency," he suggests in conclusion, "might well give rise to a regular peace-time industry."

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ANTHROPOLOGY

Marginal Indians of South Don't Miss Civilization

THE HUSTLING, bustling New World with its defense worries has a few thousand people who live a simple Stone Age existence and are quite content not to be civilized.

These marginal Indians of South America, remaining on about the same economic level for 4,000 years at least, and perhaps 20,000, now aid science to understand the New World's past, explains Dr. John M. Cooper of the Catholic University of America.

Pointing out that about two-fifths of South America—an eastern sector—is occupied or has been until quite recently by these fringe people, Dr. Cooper said:

"They are not in starvation belts. They hunt, fish, and gather roots and plants. They get along all right, and civilization does not interest them."

Even when the Incan Empire rose and fell in western South America, drawing millions of Indians into its highly organized government, marginal Indians remained untouched. They have never tried to plant seed and do farmer's work. They don't have to.

Studying these marginal people, anthropologists discover significant clues, such as seven or eight games that are played in the Chaco region of South America. These games are blanked out over a large area northward and appear again in amusements of North American hunting tribes. From such clues, Dr. Cooper said, the marginal people give perspective to North America's past as well as to that of the Southern continent, for apparently areas between that were suited to agriculture adopted it and progressed into civilization, leaving the islands of backwardness. These marginal people thus form an important part of America's saga of progress—and of standing still.

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Immunity to *flea bite* has been attained in 200 persons by use of a new antigen, according to studies at the University of California Medical School.

Limestone is quarried in every State except Delaware and New Hampshire, according to Bureau of Mines report.

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•First Glances at New Books

Additional Reviews On Page 32

MILITARY SCIENCE

THE ARMED FORCES OF THE PACIFIC—W. D. Puleston—*Yale Univ. Press,* 273 p., $2.75. The author, formerly director of the U. S. Naval Intelligence Service, is equipped both for obtaining pertinent information and for forming sound opinion. He does not believe that war between the United States and Japan is inevitable, but like a good Navy man is quite prepared for any surprise. He does believe, however, that in the event of such a war the defeat of Japan is inevitable.

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MEDICINE—CHEMISTRY

MEDICAL MANUAL OF CHEMICAL WARFARE—*Chemical Pub. Co.,* 119 p., illus., $2.50. See page 23.

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BIOCHEMISTRY

INTRODUCTION TO PHYSICAL BIOCHEMISTRY—J. M. Johlin—*Hoeber,* 231 p., illus., $2.75. An advanced text, intended for the use of research students in physiology and medicine, by a member of the faculty of Vanderbilt University School of Medicine.

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METEOROLOGY—AERONAUTICS

METEOROLOGY FOR PILOTS — B. C. Haynes—*Govt. Print. Off.,* 167 p., illus., maps, 75c, paper; $1.25, fabrikoid. (Civil Aeronautics Bull. No. 25). A manual of particular usefulness in the vast program of pilot training, in both civil and military fields, that has been undertaken in this country. Essential facts and principles are compactly presented and illustrated with clear diagrams.

Science News Letter, July 12, 1941

MILITARY SCIENCE

ANTIAIRCRAFT DEFENSE—*Military Service Pub. Co.,* 603 p., charts, illus., $2. A manual for soldiers engaged in antiaircraft defense, with full description of materiél, instructions for drill, use in action and care in the field, tables of firing data, organization personnel, etc. This will be the best-thumbed book in all AA training groups.

Science News Letter, July 12, 1941

AGRICULTURE

LAND CLASSIFICATION IN THE UNITED STATES—Report of the Land Committee to the National Resources Planning Board —*Govt. Print. Off.,* 151 p., 60c. This publication is a survey of surveys—an endeavor to obtain an understanding of all types of land classification that have been undertaken in this country, and to give at least a good general interpretation of results thus far obtained, together with an appreciation of work that remains to be accomplished.

Science News Letter, July 12, 1941

NAVAL SCIENCE

SEA POWER IN THE MACHINE AGE—Bernard Brodie—*Princeton Univ. Press,* 466 p., $3.75. See page 29.

Science News Letter, July 12, 1941

DENDROLOGY

A GUIDE TO THE TREES—Carlton C. Curtis—*Greenberg,* 208 p., illus., $1.50. A handy little manual, just the right size to slip in the pocket of a field coat, with leaf-and-fruit sketches of trees most frequently encountered and brief, non-technical descriptions. The workable dichotomous key is also in non-technical English.

Science News Letter, July 12, 1941

MEDICINE

BROADWAY STOMACH—Joseph F. Montague—*Simon and Schuster,* 356 p., illus., $2. Broadway stomach is defined as a stomach with the jitters. High tension living is given as the cause, and the condition may be minor or serious. Dr. Montague explains clearly how emotions and nerves affect the entire digestive tract and gives much common sense advice, although in a vivid and brisk style not usually associated with common sense, on how to avoid Broadway stomach.

Science News Letter, July 12, 1941

MEDICINE—CHEMISTRY

MANUAL OF CLINICAL CHEMISTRY—Miriam Reiner—*Interscience Pub.,* 296 p., $3. This manual, elaborated from instructions prepared for internes and laboratory technicians at Mount Sinai Hospital, New York City, includes tests for hormones and vitamins and directions for preparation of house dust and pollen extracts and the like.

Science News Letter, July 12, 1941

MEDICINE

NEUROLOGIC NURSING—Nicholas Gotten and Letitia Wilson—*F. A. Davis,* 195 p., 46 illus., $3. A textbook for student nurses on a subject which, according to the authors, is generally slighted in the usual nursing courses.

Science News Letter, July 12, 1941

GEOGRAPHY

COLOMBIA, GATEWAY TO SOUTH AMERICA — Kathleen Romoli — *Doubleday, Doran,* 364 p., illus., $3.50. Another of the pleasant crop of books that are springing up, to enable North Americans to discover South America. Colombia is a land of contrasts, says this author, and she enjoys analyzing for the reader the psychology of various types of Colombians, the past and present of the civilization, and the city-to-jungle variety of the country.

Science News Letter, July 12, 1941

MEDICINE

AN INTRODUCTION TO MEDICAL SCIENCE (2d ed.) — William Boyd — *Lea & Febiger,* 358 p., illus., $3.50. See page 24.

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ANTHROPOLOGY

ANTHROPOLOGICAL PAPERS, No. 13-18—Bureau of American Ethnology—*Govt. Print. Off.,* 368 p., illus., 70c. (Bull. 128). Six monographs on American Indian topics, including Indian mining, Iroquois suicide, and birchbark art of the River Desert Algonquin.

Science News Letter, July 12, 1941

MATHEMATICS—CHEMISTRY

CHEMICAL ARITHMETIC (2d ed.)—Saul B. Arenson—*Wiley,* 130 p., $1.50. A large collection of problems are here given, along with the methods for their solution. It might be used either with a course in general chemistry, or one specifically on chemical arithmetic.

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MATHEMATICS

PARTIAL DIFFERENTIAL EQUATIONS—Frederic H. Miller—*Wiley,* 259 p., $3. Despite their importance in analysis, geometry and the physical sciences, says the author, partial differential equations are either ignored or dismissed in a chapter or two in most of the texts. Here he supplies a work to eliminate that deficiency.

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HYGIENE

EFFECTIVE LIVING—C. E. Turner and Elizabeth McHose—*Mosby,* 432 p., illus., $1.90. A hygiene textbook for high school students which constantly emphasizes the principles of hygiene as a guide not only to health but to living well.

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•First Glances at New Books

Additional Reviews On Page 31

METEOROLOGY—GEOLOGY—BOTANY

REPORTS OF THE GREENLAND EXPEDITIONS OF THE UNIVERSITY OF MICHIGAN, Part II, Meteorology, Physiography, and Botany—William Herbert Hobbs, ed.—*University of Michigan Press,* 287 p., 34 pl., $5. These well-presented descriptive data, obtained by one of the best organized expeditions that has ever studied the frozen sub-continent to the north, will be of special interest, now that Greenland proves to be a key post on the American defense frontier.

Science News Letter, July 12, 1941

PHYSICS

THE SPECIAL THEORY OF RELATIVITY—Herbert Dingle—*Chemical Pub. Co.,* 94 p., $1.50. Though devoted to the special theory, the last chapter of this interesting little work, by a leading British physicist, discusses the transition to the general theory. Rather surprisingly, one looks in vain in the index among other names, for the one that would seem most likely of all to be there—that of Einstein.

Science News Letter, July 12, 1941

MATHEMATICS

ELEMENTARY FUNCTIONS AND APPLICATIONS (rev. ed.)—Arthur Sullivan Gale and Charles William Watkeys—*Holt,* 409 p., $2.25. The new edition of a text for a college course for freshmen, involving elementary functions, algebraic and transcendental, and their applications to problems arising in various fields of knowledge.

Science News Letter, July 12, 1941

MATHEMATICS

STATISTICAL CALCULATION FOR BEGINNERS — E. G. Chambers — *Cambridge (Macmillan),* 110 p., $2. Statistical methods are useful in many fields, and this little book will do much to spread knowledge of their use. "No assumption of mathematical ability on the part of the reader is made; the calculations described involve the use of arithmetic only," says the author reassuringly.

Science News Letter, July 12, 1941

MEDICINE

MINE EYES HAVE SEEN, A Woman Doctor's Saga—Alfreda Withington—*Dutton,* 311 p., $3.50. If you like adventure stories and tales of achievement, you want to read this autobiography of a woman doctor whose entire life has been devoted to pioneering in one field after another, from her efforts to gain a medical education when that was generally denied to women, through experiences with the Grenfell Mission in Labrador and with other missions in France during 1917-1918, to settlement work in the remote Kentucky mountains.

Science News Letter, July 12, 1941

MEDICINE—SOCIOLOGY

MENTAL DISEASE AND SOCIAL WELFARE—Horatio M. Pollock—*State Hospitals Press,* 237 p., $2. Basing his estimate on reliable statistics and present trends, the author figures that one out of every ten men, women and children in the United States are now, or may expect to be, suffering from mental disease. The magnitude of mental illness as a social problem is evident.

Science News Letter, July 12, 1941

MEDICINE—ECONOMICS

AMERICA ORGANIZES MEDICINE — Michael M. Davis—*Harper,* 335 p., $3. National defense preparations have to some extent sidetracked discussion of another important national problem, that of providing adequate health and medical care for all classes of the population, though everyone recognizes the importance of health for defense. Dr. Davis' book, which reviews the problem and the many measures suggested for its solution, should stimulate continued interest in the subject and give many readers a new viewpoint from which to consider future proposals for a national plan for health and medical care.

Science News Letter, July 12, 1941

GEOLOGY

THE LAST MILLION YEARS, A History of the Pleistocene in North America—A. P. Coleman; George F. Kay, ed. — *Univ. of Toronto Press,* 216 p., illus., $3.50. Written by a Canadian, edited by an American, published in Canada, this is a truly international work. It is a popular (but not "written-down") account of the last great Ice Age in North America—a matter of joint interest to Canadians and people in "the States."

Science News Letter, July 12, 1941

GEOLOGY

CALDERAS AND THEIR ORIGIN—Howel Williams—*Univ. of Calif. Press,* 107 p., illus., $1.25. The author concludes that vast open craters like Kilauea and Aniakchak are formed primarily by undermining and collapse.

Science News Letter, July 12, 1941

EDUCATION

THE NEW PROMETHEUS—Lyman Bryson—*Macmillan,* 107 p., $1. Prometheus stole fire from the jealous gods and gave it to men. But he did not give to man the knowledge of how to make fire or how to use it for his greatest good. The author envisions the new Promethean enterprise as more than just giving fire to men—they have enough already and fire is dangerous. This enterprise, he says, "is to give men both power and the knowledge of its possible uses for their good. It is to help them from suffering at the hands of those who have knowledge and would use it against them. It is to give common ownership to effective thought and also to the knowledge of what there is in the world worth having, including freedom and how to keep it. The teacher is the friend who makes men free."

Science News Letter, July 12, 1941

NAVAL SCIENCE

SUBMARINES, ADMIRALS AND NAVIES—Colin Mayers—*Associated Publications, Los Angeles,* 280 p., $3. A British naval officer relates stories, hitherto unpublished, of the role of submarines in the first World War. Many projects were listened to, some of them tried with success, more with unsuccess. However, Comdr. Mayers' zeal for his favorite weapon feeds on the successes and remains undeterred by failures; he foresees great days ahead for submarines.

Science News Letter, July 12, 1941

EDUCATIONAL PERIODICALS

REAL HEROES, No. 1—64 p., colored comics, 10 c. per copy, $1. for 12 issues. CALLING ALL GIRLS, No. 1—64 p., colored comics, 10 c. per copy, $1. for 12 issues. To meet the problem of "trashy, lurid 'comic' magazines which boys and girls insist on buying," these publishers have launched three competitive magazines, each playing up the popular comic cartoon art style but providing a wholesome and educational array of thrills and features. "Real Heroes" presents men and women who have faced danger and done hard jobs well, including present day figures as well as those from the past. "Calling All Girls" is for "forgotten" younger girls, and supplements comic art pages with stories, cooking lessons, and varied features. "True Comics" was reviewed in SNL, March 22, 1941.

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